

Review Of Four Juvenile Salmon Coded Wire Tag Experiments Conducted In The Delta

prepared by Brandes, Patricia Little

submitted to Science Program 2004

compiled 2005-01-06 08:42:11 PST

Project

This proposal is for the Science Program 2004 solicitation as prepared by Brandes, Patricia Little.

The submission deadline is 2005-01-06 17:00:00 PST (approximately 8 hours from now).

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Instructions

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Proposal Title *Review of four juvenile salmon coded wire tag experiments conducted in the Delta*

Institutions U.S. Fish and Wildlife Service

List each institution involved, one per line.

Proposal Document

You have already uploaded a proposal document. [View it](#) to verify that it appears as you expect. You may replace it by uploading another document

Project Duration *12 months*

Is the start date a determining factor to the successful outcome of the proposed effort?

☒ No.

☐ Yes. Anticipated start date of this effort:

Select all of the following study topics which apply to this proposal.

- ☒ life cycle models and population biology of key species
- ☒ environmental influences on key species and ecosystems
- ☒ relative stresses on key fish species
- ☒ direct and indirect effects of diversions on at-risk species
 - ☐ processes controlling Delta water quality
 - ☐ implications of future change on regional hydrology, water operations, and environmental processes
 - ☐ water management models for prediction, optimization, and strategic assessments
- ☒ assessment and monitoring
- ☒ salmonid-related projects
 - ☐ Delta smelt-related projects

Select as many keywords as necessary to describe this proposal (minimum of 3).

- ☐ *adaptive management*
- ☐ *aquatic plants*
- ☐ *benthic invertebrates*
- ☒ *biological indicators*
- ☐ *birds*
 - ☐ neotropical migratory birds
 - ☐ shorebirds
 - ☐ upland birds
 - ☐ wading birds
 - ☐ waterfowl
- ☐ *climate*
 - ☐ climate change
 - ☐ precipitation
 - ☐ sea level rise
 - ☐ snowmelt
- ☐ *contaminants / toxicants / pollutants*
 - ☐ contaminants and toxicity of unknown origin
 - ☐ emerging contaminants
 - ☐ mercury
 - ☐ nutrients and oxygen depleting substances
 - ☐ organic carbon and disinfection byproduct precursors

- persistent organic contaminants
- pesticides
- salinity
- sediment and turbidity
- selenium
- trace metals
- **database management**
- **economics**
- **engineering**
- civil
- environmental
- hydraulic
- **environmental education**
- X environmental impact analysis**
- **environmental laws and regulations**
- **environmental risk assessment**
- X fish biology**
- bass and other centrarchids
- delta smelt
- longfin smelt
- other species
- X salmon and steelhead**
- splittail
- striped bass
- sturgeon
- **fish management and facilities**
- hatcheries
- ladders and passage
- screens
- **forestry**
- **genetics**
- **geochemistry**
- **geographic information systems (GIS)**
- **geology**
- **geomorphology**
- **groundwater**
- **habitat**
- benthos
- channels and sloughs
- flooded islands
- floodplains and bypasses
- oceanic
- reservoirs
- riparian
- rivers and streams
- shallow water
- upland habitat
- vernal pools
- water column
- wetlands, freshwater
- wetlands, seasonal
- wetlands, tidal
- **human health**
- **hydrodynamics**
- **hydrology**
- **insects**
- **invasive species / non–native species / exotic species**
- **land use management, planning, and zoning**
- **limnology**
- **mammals**
- large
- small
- **microbiology / bacteriology**
- **modeling**
- conceptual

- quantitative
- X monitoring**
- X natural resource management**
 - *performance measures*
 - *phytoplankton*
 - *plants*
 - *primary productivity*
 - *reptiles*
 - *restoration ecology*
 - *riparian ecology*
 - *sediment*
 - *soil science*
 - *statistics*
 - *subsidence*
 - *trophic dynamics and food webs*
 - *water operations*
- X barriers**
- X diversions / pumps / intakes / exports**
- X gates**
 - levees
 - reservoirs
 - **water quality management**
 - ag runoff
 - mine waste assessment and remediation
 - remediation
 - temperature
 - urban runoff
 - water quality assessment and monitoring
 - **water resource management**
 - **water supply**
 - demand
 - environmental water account
 - water level
 - water storage
 - **watershed management**
 - **weed science**
 - **wildlife**
 - ecology
 - management
 - wildlife–friendly agriculture
 - **zooplankton**
 - **administrative**

Indicate whether your project area is local, regional, or system–wide. If it is local, provide a central ZIP Code. If it is regional, provide the central ZIP Code and choose the counties affected. If it is system–wide, describe the area using information such as water bodies, river miles, and road intersections.	
X local	ZIP Code: 95205
– regional	ZIP Code: counties:
– system–wide	

Does your project fall on or adjacent to tribal lands?
No.

(Refer to California Indian reservations to locate tribal lands.)

If it does, list the tribal lands.

Has a proposal for this effort or a similar effort ever been submitted to CALFED for funding or to any other public agency for funding?

No.

If yes, complete the table below.

Status	Proposal Title	Funding Source	Amount	Comments
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Has the lead scientist or principal investigator of this effort ever submitted a proposal to CALFED for funding or to any other public agency for funding?

Yes.

If yes, provide the name of the project, when it was submitted, and to which agency and funding mechanism it was submitted. Also describe the outcome and any other pertinent details describing the proposal's current status.

1). Delta Rearing White Paper, 1999, Interagency Ecological Program (IEP), funding provided through contract with DWR and USBR, oral presentation presented CALFED Science 10/04, White paper to be completed June 2005. 2). Smolt Emigration through the Delta, 1999, IEP funding provided through contract with DWR and USBR, white paper in final draft to be completed in 2005. 3). Central Delta versus North Delta survival for juvenile salmon, 2000, IEP, funding through contract with DWR and USBR, white paper in progress. 4. Evaluation of the effects of the operation of the Delta Cross Channel and proposed Through Delta Facility on the survival of yearling fall-run Chinook salmon migrating through the Central Delta., 2003. USBR, funding provided by USBR through contract, reported completed June 2003.

All applicants must identify all sources of funding other than the funds requested through this solicitation to support the effort outlined in their proposal. Applicants must include the status of these commitments (tentative, approved, received), the source, and any cost-sharing requirements. Successful proposals that demonstrate multiple sources of funding must have the commitment of the non-Science Program PSP related funding within 30 days of notification of approval of Science Program PSP funds. If an applicant fails to secure the non-Science Program PSP funds identified in the proposal, and as a result has insufficient funds to complete the project, CBDA retains the option to amend or terminate the award. The California Bay-Delta Authority reserves the right to audit grantees.

Status	Proposal Title	Funding Source	Period Of Commitment	Requirements And Comments
<i>approved</i>	<i>Review of four Juvenile salmon Coded wire Tag Experiments conducted in the Delta</i>	<i>USFWS and USBR</i>	<i>3 years and indefinite</i>	<i>Cost sharing is for lead scientist time paid for through agency funds</i>

Are you specifically seeking non-federal cost-share funds for this proposal?

No.

In addition to the general funds available, are you targeting additional funds set aside specifically for collaborative proposals?

No.

List people you feel are qualified to act as scientific reviewers for this proposal and are not associated with CALFED.

Full Name	Organization	Telephone	E-Mail	Expertise
<i>Ken Newman</i>	<i>University of Saint Andrews, Scotland</i>	<i>44-133-484-0251</i>	<i>ken@mcs.st-and.ac.uk</i>	<i>statistics</i>
<i>Bryan Manley</i>	<i>West, Inc.</i>	<i>307-643-1756</i>	<i>bmanly@west-inc.com</i>	<i>statistics</i>

Executive Summary

Provide a brief but complete summary description of the proposed project; its geographic location; project objective; approach to implement the proposal; hypotheses being tested; expected outcomes; and relationship to Science Program priorities. The Executive Summary should be a concise, informative, stand-alone description of the proposed project. (This information will be made public on our website shortly after the closing date of this PSP.)

Review of four juvenile salmon coded wire tag experiments conducted in the Delta

Executive Summary

Executive Summary

The purpose of this project is to re-examine historical and on-going studies involving the release and recovery of juvenile Chinook hatchery salmon in the Delta to determine what has been or can be learned about the impacts of water projects on juvenile salmon survival. This question directly relates to the scientific topics and general CALFED Bay-Delta Program management questions identified in this solicitation by obtaining and applying information on the direct and indirect effects of the CVP and SWP Diversion on at-risk species (salmon). It also would identify weakness in the existing monitoring and assessment programs and identify how they could be improved. The USFWS would be the lead agency and hire a technical expert to review four coded wire tag experiments used to manage water project operations in the Delta for juvenile salmon. The technical expert would review the relevant literature, review study designs, conduct power analyses, review data and results, evaluate statistical methods and interpretation and suggest and evaluate alternatives if appropriate. The technical expert will meet with the lead investigator to assure a thorough and efficient review of these programs. A report of the results will be written up and provided to CALFED Science, the new EWA Panel, the SWRCB, the VAMP technical group and other interested parties. The results will be used to modify or support the experiments that presently are being used to evaluate water project affects on juvenile salmon survival. The hypothesis of the overall project is that the analyses to date is correct, and that the open cross channel, high exports, lower flows in the San Joaquin river and diversion into upper Old River decrease juvenile salmon survival through the Delta. This work will be conducted out of the Stockton USFWS office. The expected outcome would be a thorough review, with suggestions for improvement in the methods used to date. The cost of total project is \$83,100.

Give additional comments, information, etc. here.

Cost share for the USFWS's principal investigator's time is approximately \$3000.

Applicant

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All information on this page is to be provided for the agency or institution to whom funds for this proposal would be awarded.

Applicant Institution *U.S. Fish and Wildlife Service* *This list comes from the project form.*

Applicant Institution Type *federal agency*

Institution Contact

Please provide information for the primary person responsible for oversight of grant operation, management, and reporting requirements.

Salutation *Ms.*

First Name *Patricia*

Last Name *Brandes*

Street Address *4001 N. Wilson Way*

City *Stockton*

State Or Province *CA*

ZIP Code Or Mailing Code *95205*

Telephone *209-946-6400X308*
Include area code.

E-Mail *Pat_Brandes@fws.gov*

Additional information regarding prior applications submitted to CALFED by the applicant organization or agency and/or funds received from CALFED programs by applicant organization or agency may be required.

Personnel

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Instructions

Applicants must provide brief biographical sketches, titles, affiliations, and descriptions of roles, relevant to this effort, of the principal and supporting project participants by completing a Personnel Form. This includes the use of any consultants, subcontractors and/or vendors; provide information on this form for all such people.

Information provided on this form will automatically support subsequent forms to be completed as part of the Science PSP submission process. Please be mindful of what information you enter and how it may be represented in the Task and Budget forms.

Information regarding anticipated subcontractor services must be provided regardless if the specific service provider has been selected or not. If the specific subcontractor has not been identified or selected, please list TBD (to be determined) in the Full Name field and the anticipated service type in the Title field (example: Hydrology Expert).

Please provide this information before continuing to those forms.

Brandes, Patricia L.

This person is the **Lead Investigator**. Contact information for this person is required.

Full Name	Brandes, Patricia L.	example: Wright, Jeffrey R., PhD.
Institution	U.S. Fish and Wildlife Service	This list comes from the project form.
Title	Fishery Biologist	example: Dean of Engineering
Position Classification	primary staff	
Responsibilities	Developing and overseeing the implementation and analyses of juvenile salmon coded wire tag experiments conducted in the Sacramento-San Joaquin Delta since the mid-1980's.	
Qualifications		You have already uploaded a PDF file for this question. <u>Review the file</u> to verify that appears correctly.
Mailing Address	4001 N. Wilson Way	
City	Stockton	
State	CA	
ZIP	95205	
Business Phone	209-946-6400 X 308	
Mobile Phone	209-481-9447	
E-Mail	Pat_Brandes@fws.gov	

Describe other staff below. If you run out of spaces, submit your updates and return to this form.

TBA

Full Name	TBA	example: Wright, Jeffrey R., PhD. Leave blank if name not known.
Institution		This list comes from the project form.
Title	Statistical expert knowledgeable of coded wire	example: Dean of Engineering

	<i>tag experiments</i>	
Position Classification	<i>subcontractor</i>	
Responsibilities	Carry out analyses and review of four coded wire tag experiments used for juvenile salmon management in the Delta.	
Qualifications		<p><i>This is only required for primary staff.</i></p> <p>Upload a <u>PDF version</u> of this person's resume that is no more than five pages long. To upload a resume, use the "Browse" button to select the PDF file containing the resume.</p>

Contract Administator

Full Name		<p>example: Wright, Jeffrey R., PhD.</p> <p>Leave blank if name not known.</p>
Institution	<i>U.S. Fish and Wildlife Service</i>	<i>This list comes from the project form.</i>
Title	<i>Contract Administator</i>	<i>example: Dean of Engineering</i>
Position Classification	<i>secondary staff</i>	
Responsibilities	Administer the contract with technical expert	
Qualifications		<p><i>This is only required for primary staff.</i></p> <p>Upload a <u>PDF version</u> of this person's resume that is no more than five pages long. To upload a resume, use the "Browse" button to select the PDF file containing the resume.</p>

Conflict Of Interest

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Instructions

To help Science Program staff manage potential conflicts of interest in the review and selection process, we need some information about who will directly benefit if your proposal is funded. We need to know of individuals in the following categories:

- Applicants listed in the proposal who wrote the proposal, will be performing the tasks listed in the proposal, or who will benefit financially if the proposal is funded;
- Subcontractors listed in the proposal who will perform some tasks listed in the proposal and will benefit financially if the proposal is funded.

Applicant U.S. Fish and Wildlife Service

Submitter Brandes, Patricia Little

Primary Staff Brandes, Patricia L.

Subcontractor TBA

Secondary Staff *Contract Administrator

Are there other persons not listed above who helped with proposal development?

Yes.

If there are, provide below the list of names and organizations of all individuals not listed in the proposal who helped with proposal development along with any comments.

Ken Newman, University of St. Andrews and Bryan Manley consultant with West Inc., I asked these individuals to provide an estimate of the time and cost to do the analyses identified in the proposal.

Tasks

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Instructions

Utilize this Task Table to delineate the tasks identified in your project description. Each task and subtask must have a number, title, brief description of the task (detailed information should be provided in the project description), timeline, list of personnel or subcontractors providing services on each specific task, and list of anticipated deliverables (where appropriate). When creating subtasks, information must be provided in a way that avoids double presentation of supporting tasks within the overall task (i.e. avoid double counting). Information provided in the Task Table will be used to support the Budget Form. Ensuring information regarding deliverables, personnel and costs associated with subtasks are only provided once is imperative for purposes of avoiding double counting of efforts within the Budget Form.

For proposals involving multiple institutions (including subcontractors), the table must clearly state which institutions are performing which tasks and subtasks.

Task ID	Task Name	Start Month	End Month	Personnel Involved	Description	Deliverables
1	<i>Review four coded wire tag programs</i>	1	6	TBA	Technical expert will review background material, review study designs, conduct power analyses, review data and results, evaluate statistical methods and interpretation and suggest alternative approaches if warranted	Read literature, complete analyses and review program
2	<i>Report</i>	6	12	TBA	Contractor will write up findings of review and alternative approaches if warranted in a white paper.	Report of findings submitted to USFWS, SWRCB, CALFED Science and VAMP technical group.
3	<i>Administer the contract</i>	1	12	*Contract Administrator	Will see that the contract is let and technical expert is selected.	Technical expert is selected

Budget

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Instructions

All applicants must complete a budget for each task and subtask. The Budget Form uses data entered in the Task Form, thus tasks should be entered before starting this form. Failure to complete a Budget Form for each task and/or subtask will result in removal of the application from consideration for funding.

CBDA retains the right to request additional information pertaining to the items, rates, and justification of the information presented in the Budget Form(s).

Supporting details on how costs were derived for each line item must be included in the justification section for each item. The cost detail for each item should include the individual cost calculations associated with each line item to provide the basis for determining the total amount for each budget category.

Following are guidelines for completing the justification section of this form:

Labor (Salary & Wages)

Ensure each employee and associated classification is correctly identified for each task and subtask. This information will automatically be provided once the Staff Form has been completed. Provide estimated hours and hourly rate of compensation for each position proposed in the project.

Employee Benefits

Benefits, calculated as a percentage of salaries, are contributions made by the applicant for sick leave, retirement, insurance, etc. Provide the overall benefit rate and specify benefits included in this rate for each employee classification proposed in the project.

Travel

Travel includes the cost of transportation, subsistence, and other associated costs incurred by personnel during the term of the project. Provide purpose and estimated costs for all travel. Reoccurring travel costs for a particular task or subtask may be combined into one entry. The number of trips and cost for each occurrence must be clearly represented in the justification section for reoccurring travel items of this nature.

Any reimbursement for necessary travel and per diem shall be at rates specified by the California Department of Personnel Administration for similar employees (www.dpa.ca.gov/jobinfo/statetravel.shtml).

Equipment

Equipment is classified as any item of \$5,000 or more and has an expected life of three years or more. Equipment purchased in whole or in part with these grant funds must be itemized. List each piece of equipment and provide a brief description and justification for each.

Supplies

Provide a basic description and cost for expendable research supplies. Costs associated with GIS services, air photos, reports, etc. must be listed separately and have a clear justification associated with each entry. Postage, copying, phone, fax and other basic operational costs associated with each task and subtask may be combined unless the cost associated with one particular service is unusually excessive.

Subcontractor Services

Subcontractor services (Professional and Consultant services) include the total costs for any services needed by the applicant to complete the project tasks. Ensure the correct organization is entered in the Personnel Form so that it appropriately appears on the Budget Form. The applicant must provide all associated costs of all subcontractors (i.e. outside service providers) when completing this form. Applicants must be able to demonstrate that all subcontractors were selected according to an applicant's institutional requirements for the selection of subcontractors (competitive selection or sole source justification).

CBDA retains the right to request that a subcontractor provide cost estimates in writing prior to distribution of grant funds.

CBDA retains the right to request consultant, subcontractor, and/or outside service provider cost estimates in writing prior to distribution of grant funds.

Indirect Costs (Overhead)

Indirect costs are overhead expenses incurred by the applicant organization as a result of the project but are not easily identifiable with a specific project. The indirect cost rate consists of a reasonable percentage of all costs to run the agency or organization while completing the project. List the cost and items associated with indirect costs. (These items may include general office expenses such as rent, office equipment, administrative staff, operational costs, etc. Generally these items are represented by the applicant through a predetermined percentage or surcharge separate from other specific costs of items necessary to complete a specific task or subtask.)

If indirect cost rates are different for State and Federal funds, please identify each rate and the specific items included in the calculation for that rate.

Task 1, Review Four Coded Wire Tag Programs: Labor	Justification	Amount
<i>No staff was assigned to this task.</i>		
Task 1, Review Four Coded Wire Tag Programs: Benefits	Justification	Amount
<i>No staff was assigned to this task.</i>		
Task 1, Review Four Coded Wire Tag Programs: Travel Expenses	Justification	Amount
		<i>0</i>
Task 1, Review Four Coded Wire Tag Programs: Supplies And Expendables	Justification	Amount
Task 1, Review Four Coded Wire Tag Programs: Subcontractors	Justification	Amount
TBA	<i>To conduct review of the four programs and work with lead investigator</i>	<i>57600</i>
Task 1, Review Four Coded Wire Tag Programs: Equipment	Justification	Amount
Task 1, Review Four Coded Wire Tag Programs: Other Direct	Justification	Amount
Task 1, Review Four Coded Wire Tag Programs: Indirect (Overhead)	Justification	Amount
<i>FWS Overhead For Contractors</i>	<i>Overhead to adminster contract</i>	<i>3700</i>
	Task 1 Total	\$61,300
Task 2, Report: Labor	Justification	Amount
<i>No staff was assigned to this task.</i>		
Task 2, Report: Benefits	Justification	Amount
<i>No staff was assigned to this task.</i>		
Task 2, Report: Travel Expenses	Justification	Amount
Task 2, Report: Supplies And Expendables	Justification	Amount
Task 2, Report: Subcontractors	Justification	Amount
TBA	<i>To provide document of effort</i>	<i>14400</i>
Task 2, Report: Equipment	Justification	Amount
Task 2, Report: Other Direct	Justification	Amount
Task 2, Report: Indirect (Overhead)	Justification	Amount
		<i>900</i>
	Task 2 Total	\$15,300
Task 3, Administer The Contract: Labor	Justification	Amount
*Contract Administrator	<i>Pay salary of administator of contract</i>	<i>1760</i>
Task 3, Administer The Contract: Benefits	Justification	Amount
*Contract Administrator	<i>Benefits of contract administrator</i>	<i>528</i>
Task 3, Administer The Contract: Travel Expenses	Justification	Amount
Task 3, Administer The Contract: Supplies And Expendables	Justification	Amount
Task 3, Administer The Contract: Subcontractors	Justification	Amount
<i>No subcontractor was assigned to this task.</i>		
Task 3, Administer The Contract: Equipment	Justification	Amount
Task 3, Administer The Contract: Other Direct	Justification	Amount
	<i>Internal overhead</i>	<i>3042</i>
Task 3, Administer The Contract: Indirect (Overhead)	Justification	Amount
	<i>USFWS overhead</i>	<i>1170</i>

	Task 3 Total	\$6,500
	Grand Total	\$83,100

– The indirect costs may change by more than 10% if federal funds are awarded for this proposal.

What is the total of non–federal funds requested?

Review of four juvenile salmon coded wire tag experiments conducted in the Delta

Project Purpose: The purpose of this project is to re-examine historical and on-going studies involving the release and recovery of juvenile Chinook hatchery salmon in the Delta to determine what has been or can be learned about the impacts of water projects on salmon survival. The question being addressed is “How can one improve the science associated with protective measures to improve juvenile salmon survival in the Delta?” This question directly relates to the scientific topics and general CALFED Bay-Delta Program management questions identified in this solicitation by obtaining and applying information on the direct and indirect effects of the CVP and SWP Diversion on at-risk species (salmon). It also would identify weakness in the existing monitoring and assessment programs and identify how they could be improved.

Project Description:

Project goals, objectives and hypotheses and how they relate to the question or critical unknowns you propose.

The project goal is to review four Delta juvenile salmon survival programs conducted by the Stockton USFWS office:

- 1) Delta Cross Channel study,
- 2) Interior Delta versus Mainstem study,
- 3) Delta Action 8 experiment, and
- 4) Vernalis Adaptive Management Program, including assessment of the head of Old River barrier.

The objective would be to have a knowledgeable statistician or biometrician familiar with coded wire tag experiments and their limitations, conduct the following tasks specific to the four programs/experiments:

- 1) Familiarize themselves with the four programs by reading relevant literature and meeting with principal investigator.
- 2) Conduct review of four experiments
 - a. review the experimental designs,
 - b. conduct statistical power analyses and likely width of confidence intervals
 - c. examine the results and reanalyze the data if warranted
 - d. evaluate statistical methods and interpretation
 - e. suggest and evaluate alternative approaches and conduct them if possible.
- 3) Write a report summarizing findings.

The hypotheses of the four experiments are:

- 1) survival in the interior Delta is lower for juvenile salmon than in the Sacramento River,

- 2) The open Delta Cross Channel reduces juvenile salmon survival
- 3) exporting water at the CVP and SWP reduces juvenile salmon survival
- 4) reducing flows at Vernalis reduces juvenile salmon survival through the Delta and
- 5) a head of Old River barrier improves survival through the Delta

Evaluating the existing data on these issues will address how the direct and indirect effects of CVP and SWP affect juvenile salmon survival in the Delta and how it has been measured to determine if changes in the methodology and interpretation are needed. It could also influence how future studies are conducted and evaluated.

Background Information: These four experiments/programs were designed to evaluate water project actions (effects of diversion into the interior Delta through the Delta Cross Channel and Georgiana Slough, CVP and SWP exports and flow in the San Joaquin River with a barrier in upper Old River) on juvenile salmon survival through the Delta. The experiments have been conducted over the last 20 years with the Interior Delta versus Mainstem, Delta Action 8 and VAMP experiments ongoing. (A more thorough explanation of the methods for all of these experiments conducted prior to 1997 is available in Brandes and McLain, 2001)

Delta Cross Channel Experiments: The question being asked in these experiments are: Is survival through the Delta higher with the Delta Cross Channel Gates closed? Survival to Chipps Island has been estimated for paired fall run coded wire tagged hatchery juvenile salmon released upstream and downstream of the Delta Cross Channel and Georgiana Slough with the DCC gates open and closed. These experiments were conducted between 1983 and 1989. Four experiments were conducted with the DCC gates closed and nine were conducted with the DCC gates open. Survival indices were generated based on recoveries made at Chipps Island in the western Delta using a midwater trawl towed at the surface. Sampling was conducted at Chipps Island, daily for several weeks after the releases were made, with 10, twenty minute tows conducted per day. Survival indices were compared for the groups released upstream and downstream of the Delta Cross Channel and Georgiana Slough. In both cases, (using a paired *t*- test and a *t* test of the difference) survival indices were found to be significantly ($p < 0.05$) greater when fish were released downstream. When survival indices are compared between the gates open and the gates closed cases, differences were not significantly different (Brandes and McLain, 2001). The results of these two studies appear to contradict each other indicating that confounding factors may be affecting our ability to detect differences in survival between the gates open versus gates closed cases.

The closure of the Delta Cross Channel is assumed to reduce the number of juvenile salmon diverted into the interior Delta because on average a lower percentage of the water at Walnut Grove is diverted when the gates are closed. More recent studies in the vicinity of the Delta Cross Channel indicate that tidal

conditions affect the amount of water and juvenile salmon diverted into the interior Delta via the Delta Cross Channel and Georgiana Slough (D.Vogel, personal communication). On flood tides more flow and radio tagged salmon entered the Delta Cross Channel (D.Vogel, personal communication). Also on flood tides with the gates closed more flow and radio tagged salmon entered Georgiana Slough (D.Vogel, personal communication). At lower flows the relative force of the flood tide (in the vicinity of the Delta Cross Channel and Georgiana Slough) would be greater than at high flows. There are potentially times, under strong flood tides that the differences in survival, between the gates open and gates closed, would be minimal because in both cases most of the marked fish would have entered the interior Delta. The opposite may also be true – where on ebb tides diversion into the either DCC or Georgiana Slough would be less and the differences in survival upstream versus downstream would be less with the gates open or closed. Closing the Delta Cross Channel gates also is hypothesized to increase the percentage of Sacramento River water diverted into Steamboat and Sutter Sloughs (J. Burau, personal communication).

The reason we may not see significant differences between the gate open and gate closed treatments is because these changes in diversion at Steamboat, Sutter and Georgiana Sloughs and Delta Cross Channel at various tides and flows likely affected our results, since these variables were not controlled for in these past releases. In the open and closed gate comparisons, tidal differences between replicates may be the explanation, because some replicates did show the expected difference whereas others did not, thereby causing the non-significant result. Releases were also made downstream of Steamboat and Sutter which wouldn't reflect the potential affects on survival of more juvenile salmon being diverted into Steamboat and Sutter Sloughs when the gates are closed.

This discussion points out some of the various complications and confounding factors in conducting these types of large scale field studies. Additional confounding factors include between year effects, flow effects, sampling error, and time of release. The need to control for these confounding factors while estimating the effect of the variable of interest is crucial and has lead to statistical modeling.

Statistical modeling of all of the fall run coded wire tag releases made in the Sacramento Delta indicate that closing the Delta Cross Channel will likely increase survival through the Delta of fall run juvenile salmon smolts originating from the Sacramento basin (Newman and Rice, 2002)(Newman, 2003).

Interior Delta versus mainstem Sacramento River Delta releases

The question asked in this experiment is, “Is interior Delta survival lower than mainstem survival for juvenile salmon?”. The hypothesis is that juvenile salmon diverted into the Central Delta have lower survival than for those that stay on the mainstem and are not diverted into the interior Delta via the Delta Cross Channel

or Georgiana Slough. Paired groups of coded wire tag juvenile salmon have been released in Georgiana Slough and at Ryde between 1992 and 1994 (n=7) with fall run hatchery smolts from Feather River Hatchery (Brandes and McLain, 2001) and between 1993 and 2004 (n=13) with late-fall hatchery fish from Coleman National Fish Hatchery (discussed below). Results for the fall run consistently showed that survival indices using Chipps Island recoveries and ocean recovery rates are significantly greater for smolts released in the mainstem Sacramento River at Ryde or Isleton than they are for juvenile salmon released into Georgiana Slough (Brandes and McLain, 2001). (Paired t-tests and one sample t-tests on the differences were done for fall run smolt survival indices at Chipps Island ($t=3.14$, $n=7$, $P=0.019$) and ocean recovery rates ($t=4.19$, $n=7$, $P=0.005$)). Similar relationships are observed for late-fall run despite the cooler temperatures and larger size of the fish relative to fall run. One sample t-tests on the differences were done for smolt survival indices 1993-2003 ($t=4.59$, $n=13$, $P=0.0007$) and for ocean recovery rates ($t=3.40$, $n=10$, $P=0.0078$). These data infer that once fish are diverted into the Central Delta via the open Delta Cross Channel or Georgiana Slough, high relative mortality occurs for juvenile salmon migrating through the Delta in the fall, winter and spring months.

Delta Action 8 Experiments: The question being asked in this experiment is, “Is survival through the interior Delta related to project exports for late-fall run juvenile salmon?”. Delta Action 8 refers to an original Anadromous Fish Restoration Action that was proposed to evaluate CVP and SWP pumping on the survival of juvenile salmon through the Delta. The experiment was originally designed to release two sets of marked fish into Georgiana Slough and at Ryde on the mainstem Sacramento River, one at high exports and one at low exports. The ratio of the survival index of the Georgiana Slough group to the Ryde group was used to index interior Delta survival. The experiment has been conducted since 1993 using late-fall Coleman NFH hatchery fish to better represent older and larger fish migrating through the Delta in the late-fall and winter months. Results to date indicate that the survival ratio is weakly correlated to CVP/SWP exports for the mean of the 3 days after the Georgiana Slough release using both the Chipps Island survival index ratios and the ocean recovery rate ratios (Attachment 1) The data are more variable at the lower range of exports than it is at the higher export values. It has been suggested that exports may limit interior Delta survival at the higher export levels whereas at the lower export levels, other things sometimes limit survival.

Releases have also been made at Port Chicago to factor out influences downstream of Port Chicago using ocean recovery data. In some years, releases have also been made at Sacramento just prior to the releases made in Georgiana Slough and at Ryde. A further refinement to the design, starting in 2003 has been the added release at Sherman Island, which is designed to standardize trawl efficiency at Chipps Island to make year to year comparisons of the individual indices more valid.

In the last four years (and in 1993 and 1996) only one set of release groups have been used at Ryde and Georgiana Slough. The balance of the 290,000 hatchery fish available have been used for additional releases at Sacramento, Sherman Island, and at Vorden (Attachment 1). These additional releases are being made to put the Ryde and Georgiana Slough releases into further context. The Sacramento release gives an estimate of survival through the Delta. The Vorden group which is released on the Sacramento River downstream of the junctions with Steamboat and Sutter Sloughs, provides some information on the benefits or detriments of some fish being diverted into Steamboat and Sutter Sloughs when it is compared to the Sacramento group. There are limited data from these other releases since they have only recently been incorporated or ocean recovery rates are not yet available. It is anticipated that more analyses will be done on these releases in the future with modeling of late-fall survival through the Delta being our main goal. One of the critical questions we will be asking the statistician is “are these methods valid, but progress is slow because the Delta is complex, or is there a large amount of variation because the method needs improvement (larger release numbers or more trawling time)

Vernalis Adaptive Management Program (VAMP)

The question asked in this experiment is: “Is smolt survival through the Delta of San Joaquin basin salmon related to San Joaquin River flows and CVP/SWP exports with a barrier at the head of Old River?” This study has been designed to identify how juvenile salmon survival through the San Joaquin Delta is affected by San Joaquin River flow, CVP/SWP exports with and without a barrier at the head of Old River. The specific VAMP tests have been conducted for the last five years. Prior to that similar data was generated in two years, 1994 and 1997. With the VAMP data, in most years two sets of coded wire tag releases were made each year. Releases have been made each spring, at Mossdale and/or Durham Ferry on the San Joaquin River with control groups released at Jersey Point. Recoveries of the marked fish were made at Chipps Island and Antioch using midwater and Kodiak trawls respectively and in the ocean fishery two to four years after release. Sampling at Chipps Island is twice that conducted previously for other recovery efforts, with 20, twenty minute tows conducted each day. Sampling at Antioch is quite intense and covers about 40 percent of each 24 hour period, with sampling conducted during the day and during crepuscular periods. For more details on the methods and the VAMP program in general see SJRG, 2004.

Survival of juvenile Chinook salmon emigrating from the San Joaquin River system has been evaluated within the framework established by the VAMP experimental design which includes five target flow and export levels to test over a 12 year period. The San Joaquin flow levels at Vernalis to be tested are 7000, 5700, 4450, and 3200 cfs. Exports are 1500 cfs at all flow levels with the exception of a second export level (3200) to be tested at the 7000 cfs flow level

(SJRG, 2004). A 7000 cfs flow level is the only flow that has not been tested in the five years the program has been implemented.

Combined Differential Recovery Rates have been used to estimate survival from the upstream release site (Durham Ferry or Mossdale) to Jersey Point. The Delta method per Ken Newman, statistician at University of Saint Andrews, Scotland, has been used to estimate standard errors around each estimate. When estimates were not statistically different ($p < 0.05$) within a year at a particular flow and export target the two estimates were combined. Results to date have not been statistically different between the narrowly defined, three target flow and export levels tested to date. Results of the most recent two years of data are statistically different than results gathered earlier at the same target flow and export rate (SJRG, 2004b).

As part of the Vernalis Adaptive Management Program, it has been assumed there is a benefit to the installation and operation of a barrier at the head of Old River, based on data obtained between 1985 and 1990 (Brandes and McLain, 2001). It would be part of this review to include assessment of the 1985 to 1990 paired marked fish data and to identify additional approaches that could establish a continued testing phase for the barrier itself. The number of test fish available has limited our ability to continue the design used in the 1980's and still evaluate VAMP.

Hypotheses being tested and Conceptual Models

Our hypotheses for juvenile salmon survival through the Delta relies on the premise that juvenile salmon migrating from the Sacramento River basin enter the interior Delta via the open Delta Cross Channel and Georgiana Slough and that survival in the interior Delta is lower than that on the mainstem Sacramento River. Our conceptual model is that juvenile salmon encounter the Delta Cross Channel and Georgiana Slough as they migrate downstream from the Sacramento basin, through the Delta to the Pacific Ocean. A greater percentage of the Sacramento River flow enters the interior Delta when the DCC gates are open, thus closing the DCC gates is assumed to lessen the number of juvenile salmon entering the interior Delta, thereby increasing their survival. Although we assume fewer juvenile salmon enter the interior Delta with the DCC closed, some still enter via Georgiana Slough. Increasing Sacramento River flows would also lessen the percentage of water at Walnut Grove diverted into the interior Delta (Jon Burau, personal communication). Once in the interior Delta, juvenile salmon are exposed to net reverse flow in the South and Central Delta caused by export pumping. Reducing exports is assumed to lessen the reverse flows and improve the survival of juvenile salmon entering the interior Delta. The survival of smolts released into Georgiana Slough relative to those released on the mainstem Sacramento at Ryde appears to increase as exports decrease.

Some possible mechanisms for the decreased survival once fish are diverted into the interior Delta, include delays in migration, increased predation, residence times and water

temperature and the indirect and direct affects of project exports and unscreened diversions. Diversion of juvenile salmon into the interior Delta may cause juvenile salmon to be delayed in their migration to sea and increase their residence time in the Delta decreasing their survival, as the migration route that includes the interior Delta is longer and less direct. There are relatively higher temperatures in the interior Delta, resulting in habitat that is more conducive to exotic predators thus resulting in greater relative predation. Increased water temperature would also increase physiological stress and perhaps incidence of disease. The changes in the south Delta hydraulics due to the operation of the CVP and SWP likely increases residence time and the direct and indirect entrainment affects of the unscreened diversions and the CVP and SWP.

Our hypotheses for juvenile salmon migrating through the Delta for salmon that originate from the San Joaquin tributaries are that survival through the Delta will be improved with increased flow at Vernalis, decreased exports at the CVP/SWP and the installation and operation of a head of Old River Barrier. These hypotheses are based on relationships identified between San Joaquin River flow and flow relative to exports between April and June and adult escapement in the San Joaquin basin 2 ½ years later (SJRG 2003). Both relationships are statistically significant ($p < 0.01$) with the ratio of flow to exports accounting for slightly more of the variability in escapement than flow alone ($r^2 = 0.58$ versus $r^2 = 0.42$). These relationships suggest that adult escapement in the San Joaquin basin is affected by flow in the San Joaquin River and exports from the CVP and SWP during the spring months when juveniles migrate through the river and Delta to the ocean. The VAMP was designed to further define the mechanisms behind these relationships by testing how San Joaquin River flows and exports with the Head of Old River Barrier (HORB) affect smolt survival through the Delta.

Our conceptual model is that the lower flows (1) increase travel time through the Delta, (2) increase water temperatures and reduce dissolved oxygen concentrations that could lead to increased stress and disease, and (3) increase the relative effects of CVP and SWP exports and unscreened diversions. Predation is likely higher under lower flows due to increased water clarity and higher water temperatures and reduced dissolved oxygen concentration. Under lower flows, agricultural drainage would be a greater proportion of the flow and reduce water quality. We also believe that once fish are diverted into upper Old River their survival is decreased due to poor water quality, agricultural diversions and direct and indirect entrainment effects at the CVP/SWP.

General Plan of Work:

USFWS would be the lead agency. Ms. Pat Brandes, Senior Fishery Biologist would be the Principal Investigator. Ms. Brandes is the lead biologist for all of the studies listed above. USFWS would select an appropriate technical expert – with expertise in evaluation of coded wire tagging experiments and applied statistics. Funding would support the technical expert's time.

The technical expert would review the relevant literature, review the study designs, conduct power analyses, review data and results, evaluate statistical methods and

interpretation and suggest alternatives if appropriate (and conduct them if possible) for the four projects listed above. The technical expert will meet regularly (weekly or twice monthly) with Ms. Brandes. It is estimated that it will take a consultant 10 weeks – full time to thoroughly review these projects, suggest alternatives and write up a technical report on the findings. Each aspect of the program review will take approximately one to two weeks and include reviewing relevant literature (1 week), reviewing the study design and recovery methods (1 week), conducting power analyses (2 weeks), reviewing data and results (1 week), evaluating statistical methods (1 week), suggesting alternatives (2 weeks), and writing the report (2 weeks). The Service will contribute as a cost share approximately \$3000: Ms. Brandes time of approximately 40 hours – 4 hours /per week for ten weeks. Ms. Brandes salary will be paid for through CVPIA B2 monitoring and USFWS (EWA/CALFED) funds. The cost of a technical expert for ten weeks is estimated to be \$72,000. This estimate is based on 400 hours of work at \$180 per hour and would include the technical experts travel. Service overhead for pass through contracts is 6%. The overhead would amount to about \$4600. The project also includes funds for contract administration of \$6500. Total cost for the project would include funding for the technical expert (\$76,600) and contract administration (\$6500) and would equal \$83,100.

The project is feasible. The Service is capable of receiving CALFED funds, and for contracting with a technical expert, for providing the data and of contributing Ms. Brandes' time to facilitate an efficient review of these programs. It is anticipated that the process would be completed within a year of receiving funding. The expert will be selected based on his or her scientific abilities and experience in this particular technical area – coded wire tag experiments and applied statistics. A report of the results will be written up and provided to CALFED Science, the new EWA Panel, the SWRCB, the VAMP technical group and other interested parties. The results will be used to modify or support the experiments that presently are being used to evaluate water project affects on juvenile salmon survival.

The technical expert will be selected through the standard Federal Government contracting processes. Applicants will be evaluated based on their experience in applied statistics and familiarity with coded wire tag or mark and recapture experiments and their ability to meet regularly with the lead investigator. Some familiarity with these specific experiments and the Delta system in general would also make the technical expert more competitive as it would decrease the amount of time needed to “get up to speed”.

Justification: Some scientists and EWA panel members have questioned the science of these experiments. A review of this work is desired by the salmon community, stakeholders, the agencies and CALFED Science. The results of these experiments are being used to, in part, justify Delta Cross Channel Gate closures, CVP and SWP export reductions, increased flow in the San Joaquin River and a HORB to increase juvenile salmon survival through the Delta. There are many limitations to these and other coded wire tag experiments and most large scale experimental programs conducted in the field. Recovery rates are low, background conditions change and are sometimes outside of our control, and requesting specific experimental

conditions to test are many times are unsuccessful. It is our assessment, that given these limitations, the experiments and resulting data and analyses are the best they can be. However, having an outside expert thoroughly review these programs will provide the necessary in-depth peer review to continue to use these data in their present form or to identify changes to improve them. Working with the principal investigator on these experiments/programs will provide the necessary foundation to efficiently review these experiments and recommend alternative approaches. These four experimental programs are very similar in their approach and methods used for evaluation, so it is efficient to package the assessment of all four programs in one proposal. This proposal would directly address the scientific topics and general CALFED Bay-Delta Program management questions identified in this solicitation by obtaining and applying information on the direct and indirect effects of the CVP and SWP Diversion on at-risk species (salmon). It also would identify weakness in the existing monitoring and assessment programs and identify how they could be improved.

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Attachment 1:

Proposal to estimate survival of coded-wire tagged (CWT) late-fall released in the Delta in December 2004.

Brandes, 12/1504

PURPOSE: To 1) refine the relationship between exports and relative interior Delta survival 2) index and determine absolute survival of coded-wire tagged, juvenile late-fall run chinook salmon as they migrate through the Delta 3) Estimate survival to the Delta 4) Calibrate the efficiency of the Sacramento River trawl.

PROPOSAL

Releases are to be made at Sacramento, Vorden, Georgiana Slough, Ryde, Sherman Island and Port Chicago between December 6 and December 10 (Figures 1 and 2). This proposal is similar to that used in December of 2003. In 2004, we are adding one additional release at Vorden – on the Sacramento River below Steamboat and Sutter Sloughs and upstream of Walnut Grove. This design combines the two main study designs used in the past for late-fall releases in the Delta. In 1993, 1996 and since 1998, one to two paired releases were made at Ryde and in Georgiana Slough with a control group at Port Chicago. The study design used in 1996-1997 consisted of releasing two groups of CWT juvenile late-fall run Chinook salmon at Sacramento. In December of 2002, one set of releases was made in Georgiana Slough, at Ryde and at Port Chicago with an additional release at Sacramento. In 2003 the same release design was used as in 2002, but an additional release was made at Sherman Island. The Port Chicago group has sometimes been moved to Benicia when access by the military onto the base at Port Chicago has been denied. We have received clearance from the military to use the base in 2004.

The spring run surrogate release of late-fall from Battle Creek was released on November 29th, 7 days prior to the first release (Sacramento) made in the Delta. Exports are to be approximately 6000 cfs combined between December 6 and December 15 – for 10 days after the beginning of the experiment. B2 and EWA assets are to be used to pay for water costs associated with any export curtailment to maintain stable export levels during the 10 day experiment.

BACKGROUND

Paired groups released at Georgiana Slough and at Ryde, allow the survival of a Georgiana Slough group relative to a Ryde group to be estimated using the differential survival indices to Chipps Island. It is believed that if exports have an influence on survival, the greater effect will be for fish released in Georgiana Slough. This approach should increase the ‘power’ of the test to detect a difference if one exists, as data variation due to a variety of uncontrollable factors is always a concern. We have used the data gathered in the past (1993-2003) to identify a relationship between the ratio of survival of the two groups and the export level (Figure 1). Marked fish are also recovered in the ocean fishery as adults and allows an independent measure of survival to also compare to exports levels (figure 4). This relationship only uses data gathered

between 1993 and 2002 since later releases (12/02 and 12/03) do not have ocean recovery information available yet.

A few concerns have been raised relative to measuring the effect of exports on survival through the interior Delta. The first concern is the level of uncertainty in the relationship. Continued replication will refine the relationship over time. Thus in 2004 we wanted to continue to measure relative interior Delta survival. Measuring relative interior Delta survival at lowest exports would be the best. The 6000 cfs level will help us achieve more replication at the mid-range of exports.

The second concern is that there may be bias in the results. During lower flows fish from our control group (Ryde) may move upstream into Cache Slough with the tides (based on radio tagging results) potentially lessening their survival and over-estimating the ratio. While there doesn't appear to be instances where the ratio is biased high in lower flow years, it is a concern that marked fish released at Ryde or Isleton may be behaving differently under low flows. In higher flows there was no evidence of movement of Ryde fish into Cache Slough. In addition, Sheila Greene has shown that the direct loss at the SWP of the Ryde group relative to the Georgiana Slough group is greater as exports increase. These data indicate that perhaps our information is somewhat biased in that exports are having an effect on the Ryde groups as well as the Georgiana Slough groups. Our proposed release at Sherman Island may be a better control group and can be used to assess differences in survival of the Ryde groups between years.

Results of the December, 2002 and 2003 are attached (Table 1 and 2). They indicated survival through the upper river to the delta was generally high for the December and January groups, and that survival in Georgiana Slough was exceptionally low. The Ryde group survived somewhat lower than the group released at Sacramento and may reflect some movement of the Sacramento fish through Steamboat and Sutter Sloughs where they may have had higher survival. This is the reason for the proposed release at Vorden in 2004. It will allow comparison between the Sacramento and Vorden group to roughly approximate how many fish went into Steamboat and Sutter Sloughs and whether it was a benefit to the Sacramento group. It would also include any main stem mortality between Sacramento and Vorden. In addition the Vorden group can estimate the effect of Georgiana Slough when survival is compared to the Ryde group. It is the same upstream release site used for the fall run upstream and downstream comparisons conducted in the 1980's.

RELEASE GROUPS

The release at Sacramento will enable us to estimate survival to the Delta (when compared to the upstream release), and through the Delta. It will also allow us to conduct an efficiency test on the release using our kodiak trawl at Sacramento, which can later be used to expand catches of unmarked winter and late-fall. It will also serve as a basis of comparison for the Vorden group

Fish would be released starting on December 6th, 7 days after the surrogate release made at the Coleman National Fish Hatchery on November 29th. The releases are scheduled between December 6 and December 10. The Sacramento release is scheduled for December 6th. Two releases at West Sacramento would be made, six hours apart (on opposite tidal phases) to achieve

an average of the potential diversion into Sutter and Steamboat Slough. The efficiency collections would also occur a few miles downstream of the Sacramento release at Sherwood Harbor. The Vorden group is to be released on December 7th. USGS is planning on releasing drifters with the Vorden release. The Georgiana Slough group is to be released on December 8th, the Ryde group released on December 9th. The Georgiana Slough group is being released a day before the Ryde group because it is expected the Georgiana Slough group will take longer to migrate to Chipps Island than the Ryde group, as the path through the Central Delta is longer than that down the mainstem Sacramento River. The Sherman Island and Port Chicago group are to be released on the 10th.

The control releases at Benicia /Port Chicago are continuing so comparisons separating ocean survival information can be made, similar to past years. The additional release at Sherman Island will standardize catches at Chipps Island and allow absolute estimates of survival to be generated for the Sacramento, Vorden, Georgiana Slough and Ryde groups of which can be used to better compare releases between years. We can also compare ocean recovery data for the Benicia and Sherman Island releases to estimate the extent of mortality occurring between the two locations. Boat operators are not available this year to allow trawling to be increased after the Sherman Island release to estimate efficiency of the trawl at Chipps Island.

The two releases made at Sacramento will be conducted six hours apart to get maximum tidal differences between the two releases. The Vorden release would be made on a slack before the ebb so groups do not move upstream into Sutter or Steamboat Sloughs. Ryde and Georgiana Slough releases will also be made during the slack before the ebb. At Ryde releasing on this tidal phase is designed to prevent any fish from moving upstream and into Georgiana Slough. The Georgiana Slough release is to be made on the slack before the ebb to give the fish time to acclimate prior to moving downstream in Georgiana Slough. There is rarely reverse flow from Georgiana Slough into the Sacramento River (Rick Oltman, personal communication). The release at Sherman Island is scheduled for a flood tide so the fish distribute across the channel prior to being recovered at Chipps Island. The Port Chicago/Benicia release is scheduled to occur on an ebb tide so less of the fish are recovered upstream at Chipps Island.

It is helpful when all tag lots (not just groups) are held separately at the hatchery. This provides the maximum flexibility to release identifiable groups over different tide cycles or provide an index of the variability in survival of the group. Two Sacramento releases of 25,000 are planned to be released at Sacramento, two 35,000 tag lots into Georgiana Slough, two 25,000 tag lots at Ryde, one 25,000 tag lot at Sherman Island, one 25,000 tag lot at Port Chicago, and two 35,000 tag groups at Vorden.

RECOVERY

Recoveries of the marked fish will be made by midwater trawl at Chipps Island, with 10 twenty minute tows daily for approximately six weeks (with the likely exception of December 25). The number of tows conducted each day will be reduced if delta smelt catches reach 170 per day, for management of our incidental take. Recoveries of each tag group at Chipps Island will be used to generate survival indices and estimates. Recoveries would also be made in the ocean fishery,

when the fish are 2 - 4 years of age to calculate independent estimates of survival for each of the groups.

Coded wire tag recoveries will also be made at the fish facilities.

ENVIRONMENTAL CONDITIONS

This proposal emphasizes the fish aspect of the proposed experiment. In past years the experiment has involved the need for an operational plan to achieve the high and/or low export conditions for the 10- 14-day experimental periods in December or January. This has been problematic in recent years. The mid export rate (6000 cfs combined) was attempted in 2004

COORDINATION

Coordination between USFWS, IEP, Coleman National Fish Hatchery, project operators, DAT and CALFED operations group will be essential to the successful implementation of this experiment.

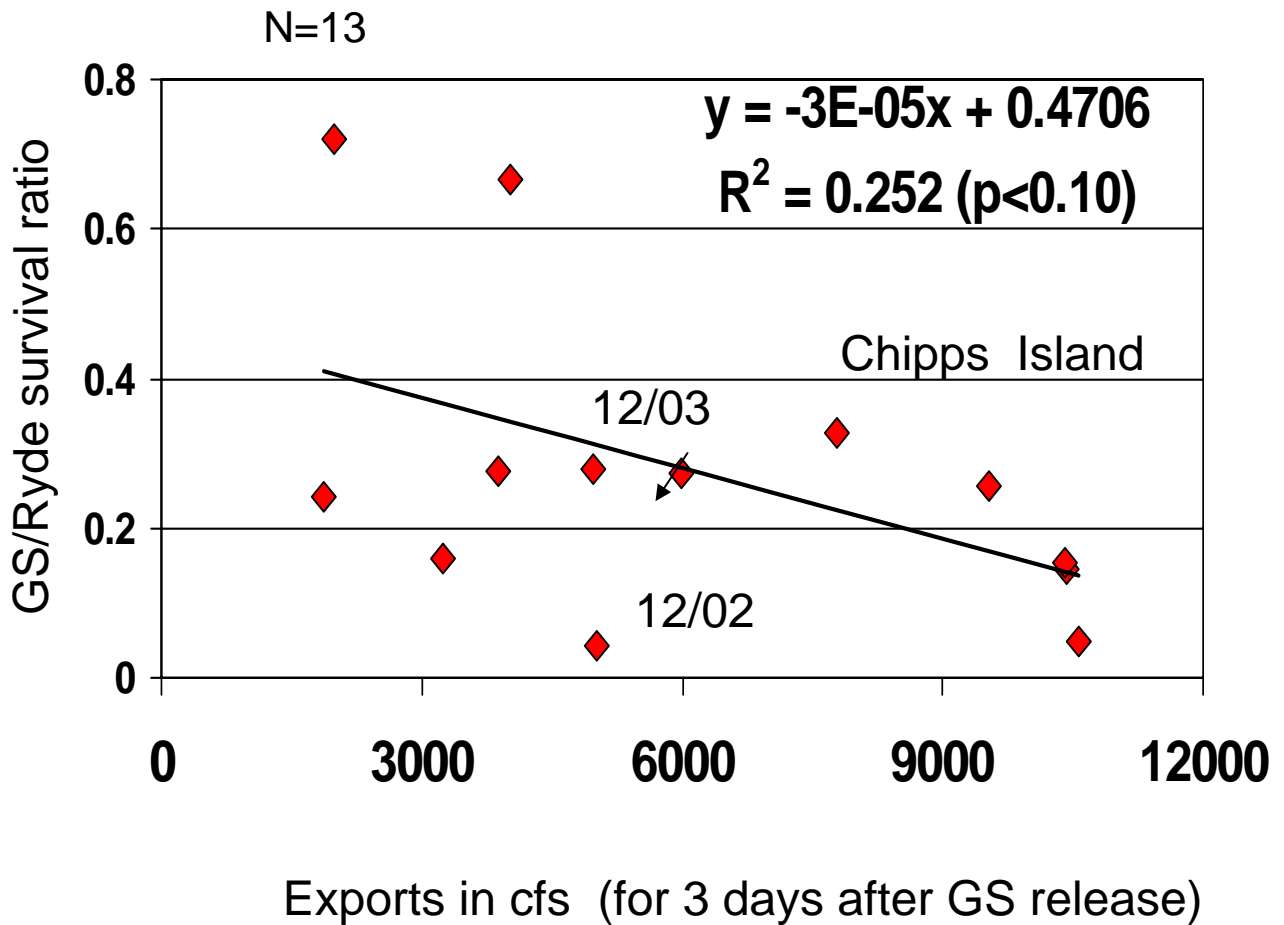


Figure 1: Relationship between GS/Ryde survival ratio (using Chipps Island survival indices) and combined exports 3 days after the Georgiana Slough release

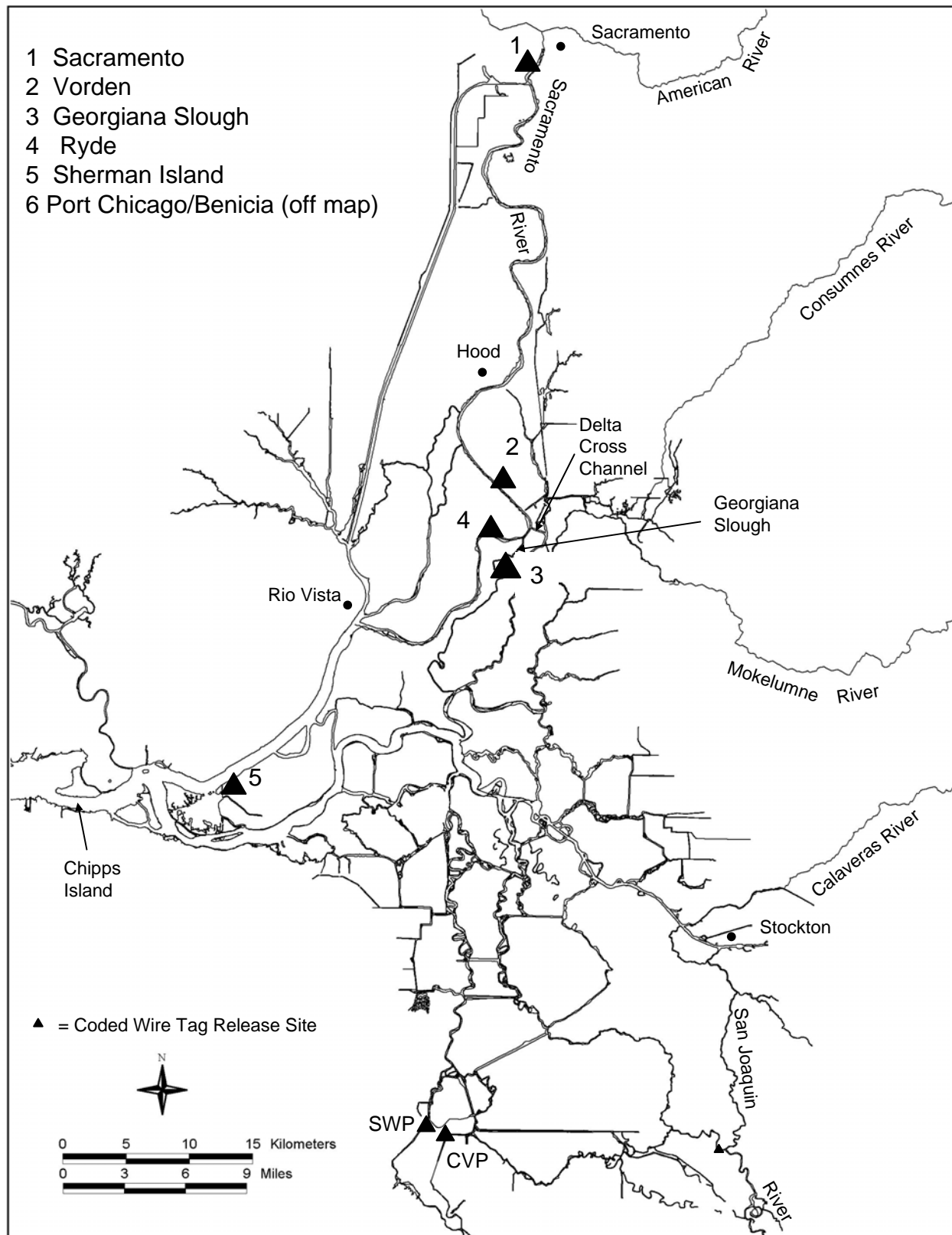


FIGURE 2 Detailed map of the Sacramento-San Joaquin Delta indicating coded wire tag release locations used in December of 2004 (triangles).

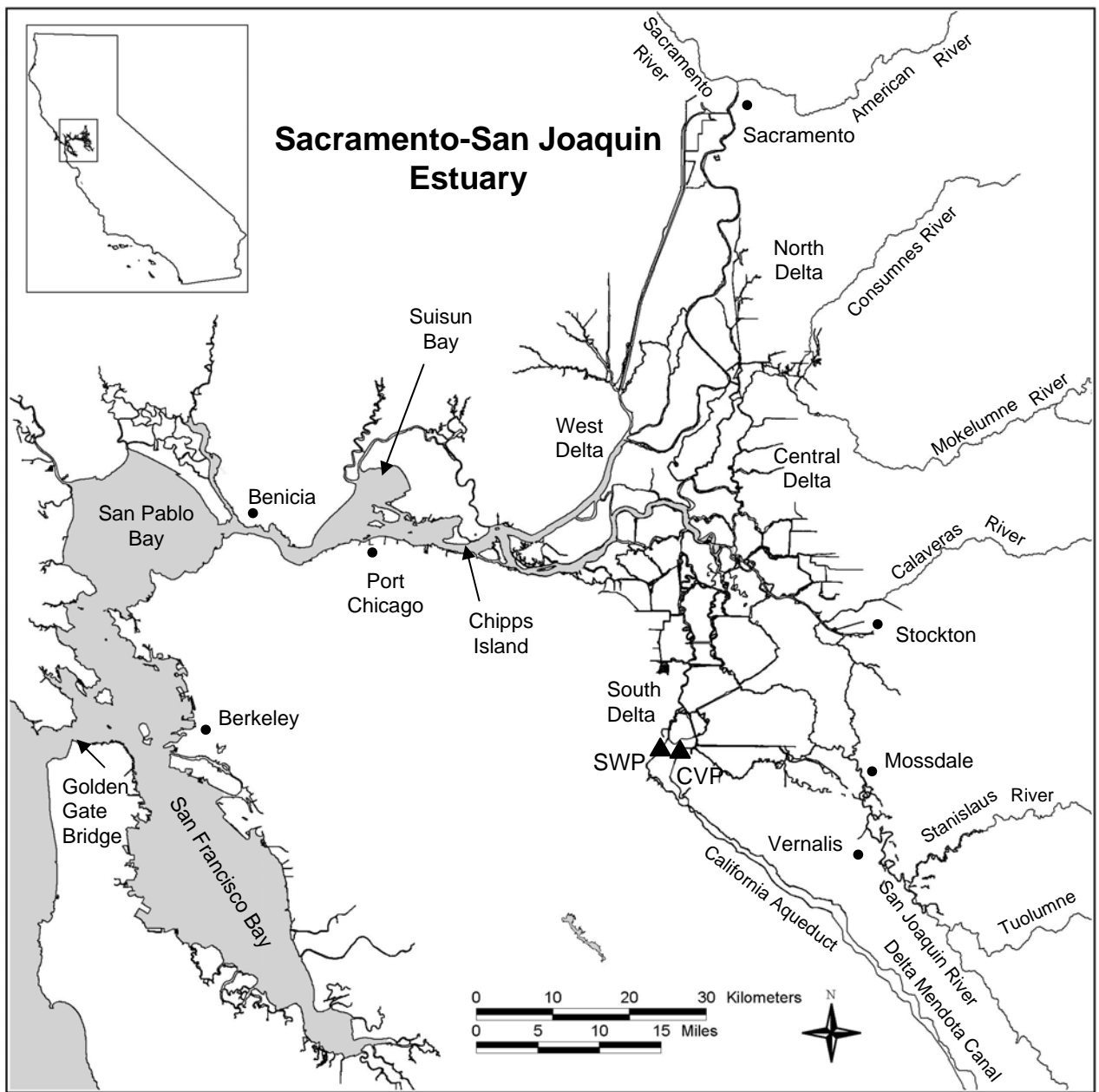
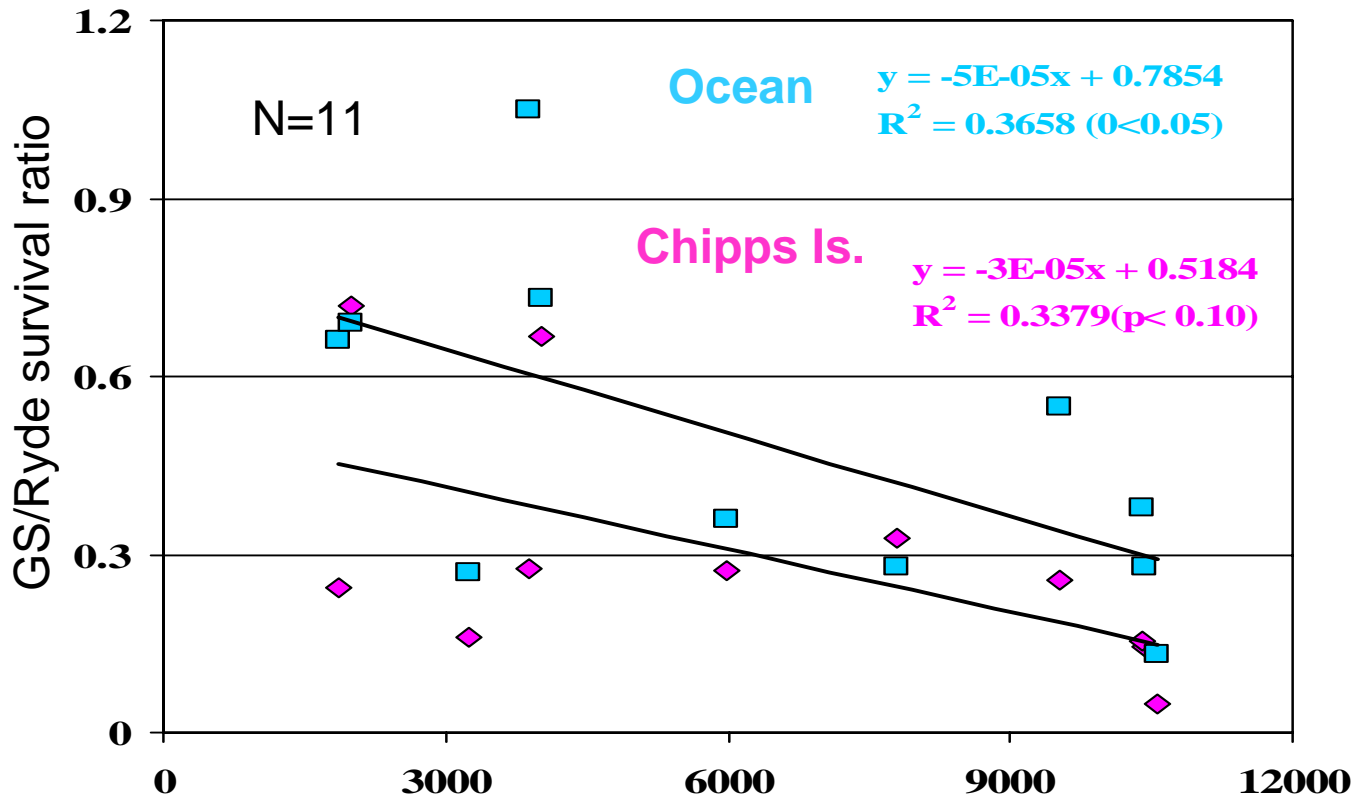


FIGURE 3 The Sacramento-San Joaquin Estuary, California.



Exports in cfs (for 3 days after GS release)

Figure 4: Relationships between GS/Ryde survival ratio (using Chipps Island and ocean recovery indices) and combined exports 3 days after the Georgiana Slough release

Table 1: Chipps Island Survival Indices for 2002-03 CNFH Latefall Releases

** DRAFT**

updated 10/2/03

Tag Code	Release Site/Stock	Date	Truck Temp (F)	River Temp (F)	Number Released **	Average Size (mm)	First Day Recovered	Last Day Recovered	Number Recovered	Minutes Fished	Percent Sampled	Survival Index	Group Index
05-10-97	Battle Creek (CNFH)	11/08/02	N/P	N/P	67691	105	12/06/02	01/04/03	13	5227	0.121	0.206	
05-10-94	Battle Creek (CNFH)	12/02/02	N/P	N/P	59887	110	12/18/02	01/14/03	29	5147	0.128	0.493	
								05/01/03	30	17283	0.089	0.733	
05-51-38	West Sacramento (CNFH)	12/03/02	55	52	69490	123	12/15/02	01/09/03	35	4757	0.127	0.515	
05-10-98***	Georgiana Slough (CNFH)	12/04/02	55	52	34871	132	--	--	0			--	
05-11-68	Georgiana Slough (CNFH)	12/05/02	55	55	55173	127	12/27/02	12/27/02	1	200	0.139	0.017	
05-11-67	Ryde (CNFH)	12/06/02	57	52	51452	139	12/10/02	01/02/03	18	4107	0.119	0.383	
05-11-66	Port Chicago (CNFH)	12/09/02	55	54	47262	137	12/11/02	12/20/02	6	--	--	--	
05-10-91	Battle Creek (CNFH)		N/P	N/P	65609	120	01/08/03	02/03/03	30	3181	0.082	0.727	
05-10-92	Battle Creek (CNFH)		N/P	N/P	56029	120	01/08/03	02/28/03	11	5181	0.069	0.369	
05-10-93	Battle Creek (CNFH)		N/P	N/P	67355	120	01/08/03	03/19/03	25	6759	0.066	0.730	
05-10-95	Battle Creek (CNFH)		N/P	N/P	71267	120	01/09/03	02/28/03	28	4981	0.068	0.753	
05-10-99	Battle Creek (CNFH)		N/P	N/P	72792	120	01/09/03	03/31/03	26	7559	0.064	0.725	
05-11-64	Battle Creek (CNFH)		N/P	N/P	67522	120	01/09/03	03/19/03	16	6559	0.065	0.473	
05-11-65	Battle Creek (CNFH)		N/P	N/P	59419	120	01/10/03	02/26/03	20	4581	0.066	0.660	
05-51-39	Battle Creek (CNFH)		N/P	N/P	66763	120	01/08/03	02/24/03	30	4781	0.069	0.845	
		01/02/03			526756		01/08/03	03/31/03	186	7759	0.065		0.70624
05-10-96	Battle Creek (CNFH)	01/15/03	N/P	N/P	74755	135	01/22/03	03/21/03	21	4978	0.059	0.623	

** Release numbers are still preliminary

*** We expected to release approx. 70,000 for this tag code, but had 98% mortality of the fish in one hauling truck due to failure of a recirculation pump; the number released is based only on the data for one truck

Table 2: Chipps Island Survival Indices for 2003-04 CNFH Latefall Release

** DRAFT **

revised: 8/27/04

Tag Code	Release Site/Stock	Release Date	Truck Temp (F)	River Temp (F)	Number Released	Average Size (mm)	First Day Recovered	Last Day Recovered	Number Recovered	Minutes Fished	Percent Sampled	Survival Index	Group Index
05-17-67	Battle Creek (CNFH)		N/P	N/P	66672	126	12/11/03	1/13/04	17	6994	0.143	0.232	0.2433776
05-17-69	Battle Creek (CNFH)		N/P	N/P	71540	113	12/11/03	1/4/04	20	5404	0.150	0.242	
	Total	11/28/03			138212		12/11/03	1/13/04	37	6994	0.143		
05-17-73	West Sacramento (CNFH)		55	54	31206	134	12/11/03	1/8/04	18	6004	0.144	0.522	0.4124324
05-17-74	West Sacramento (CNFH)		55	54	35035	127	12/11/03	1/18/04	11	7774	0.138	0.295	
	Total	12/5/03			66241		12/11/03	1/18/04	29	7774	0.138		
05-17-71	Georgiana Slough (CNFH)		50	54	35686	135	12/27/03	12/31/03	2	1000	0.139	0.052	0.0786492
05-17-72	Georgiana Slough (CNFH)		50	54	34954	135	12/29/03	1/21/04	3	3970	0.115	0.097	
	Total	12/9/03			70640		12/27/03	1/21/04	5	4370	0.117		
05-17-81	Ryde (CNFH)		54	52	25071	139	12/15/03	12/26/03	4	2190	0.127	0.164	0.2822189
05-17-82	Ryde (CNFH)		52	52	22837	139	12/15/03	1/4/04	9	3790	0.125	0.409	
	Total	12/10/03			47908		12/15/03	1/4/04	13	3790	0.125		
05-17-83	Sherman Island	12/11/03	54	54	26086	135	12/11/03	12/31/03	53	4804	0.159	1.663	0.2213237
05-17-80	Benicia (CNFH)	12/11/03	53	54	25291	132			0				
05-17-78	Vorden Road (CNFH)		54	50	25105	141	12/27/03	1/2/04	5	1200	0.119	0.218	0.2213237
05-17-79	Vorden Road (CNFH)		52	50	25100	135	12/26/03	1/29/04	5	5890	0.117	0.221	
	Total	12/21/03			50205		12/26/03	1/29/04	10	5890	0.117		
05-16-99	Battle Creek (CNFH)		N/P	N/P	72220	138	1/9/04	2/23/04	42	5472	0.083	0.915	1.0000503
05-17-64	Battle Creek (CNFH)		N/P	N/P	67485	134	1/9/04	1/24/04	25	2690	0.117	0.412	
05-17-65	Battle Creek (CNFH)		N/P	N/P	72504	129	1/9/04	3/17/04	33	7262	0.073	0.810	
05-17-68	Battle Creek (CNFH)		N/P	N/P	73450	130	1/8/04	3/26/04	35	8122	0.071	0.868	
05-17-70	Battle Creek (CNFH)		N/P	N/P	72510	127	1/8/04	1/30/04	47	3890	0.117	0.717	
05-17-75	Battle Creek (CNFH)		N/P	N/P	68440	125	1/8/04	1/24/04	31	2890	0.118	0.499	
05-17-76	Battle Creek (CNFH)		N/P	N/P	64730	128	1/8/04	3/24/04	49	7922	0.071	1.377	
05-17-77	Battle Creek (CNFH)		N/P	N/P	63444	132	1/9/04	1/24/04	41	2690	0.117	0.720	
	Total	1/2/04			554783		1/8/04	3/26/04	303	8122	0.071		
05-17-66	Battle Creek (CNFH)	1/30/04	N/P	N/P	68403	145	2/11/04	3/17/04	3	2770	0.053	0.107	

SUMMARY OF QUALIFICATIONS

Name: Patricia Little Brandes

Address: U.S. Fish and Wildlife Service
4001 N. Wilson Way
Stockton, CA 95205

Position: Fishery Biologist, Stockton
Fish and Wildlife Office

Education: B.S. Fisheries
Michigan State University, Lansing, MI – 1982

Employment: U.S. Fish and Wildlife Service, 1981 to Present

Jordan River National Fish Hatchery, Elmira, MI
Fishery Biologist Trainee – March, 1981 – Dec. 1981

Senecaville National Fish Hatchery, Senecaville, Ohio
Fishery Biologist – April, 1982 – May, 1983

Stockton Fish and Wildlife Office, Stockton, CA
Fishery Biologist – August, 1983 to Present

Responsibilities:

Responsible for designing field studies, analyzing data and reporting on the survival of juvenile chinook salmon in the Sacramento-San Joaquin Delta.

Professional Organizations:

Member of the American Fisheries Society

1/5/2005

https://solicitation.calwater.ca.gov/solicitations/2004.01/proposals/0299/forms/60

Submitter: Brandes, Patricia Little (Pat_Brandes@fws.gov)

Proposal Number: 2004.01-0299

Proposal Title: Review of four juvenile salmon coded wire tag experiments conducted in the Delta

- all representations in this proposal are truthful;
- the individual signing the form is authorized to submit the application on behalf of the applicant (if applicant is an entity or organization);
- the applicant has read and understood the conflict of interest and confidentiality discussion under the Confidentiality and Conflict of Interest Section in the main body of the PSP and waives any and all rights to privacy and confidentiality¹ of the proposal on behalf of the applicant, to the extent provided in this PSP; and
- the applicant has read and understood all attachments of this PSP.

The individual signing below declares that:

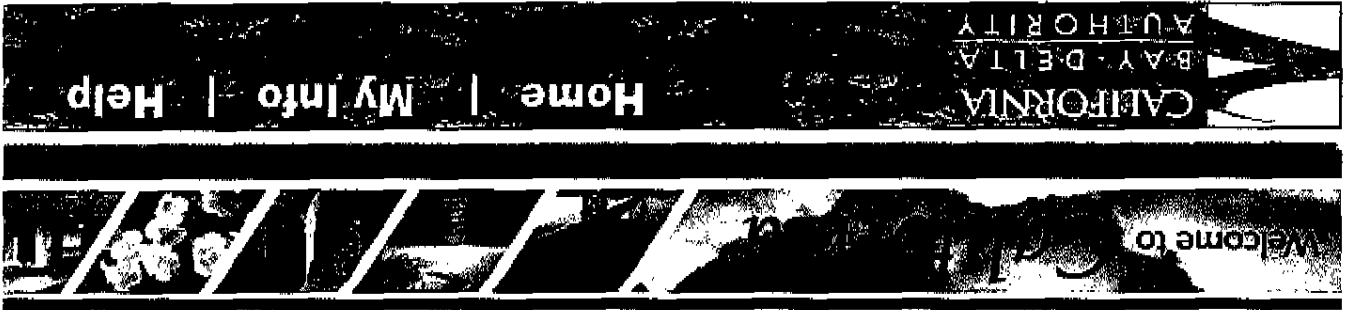
Failure to sign and submit this form will result in the application not being considered for funding.

The applicant for this proposal must submit this form by printing it, signing below, and faxing it to +1 877-408-9310.

2004-12-27: In response to user feedback, the project and conflict of interest forms have been corrected. Please read the current versions carefully.

This proposal is for the Science Program 2004 solicitation as prepared by Brandes, Patricia Little.

Review Of Four Juvenile Salmon Coded Wire Tag Experiments Conducted In The Delta: Signature



California Home

Applicant Signature

Date

SK Wells

1/5/05

Printed Name Of Applicant

Applicant Organization

for Russell Belmer
U.S. Fish and Wildlife Service

Help is available: help@ solicitation.calwater.ca.gov, +1 877 408-9310

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